12. INFORMATION SOURCES AND PROGRAMS

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Aerospace related technology can often contribute significantly to seemingly unrelated fields. The rapid dissemination of aerospace related information that is of potential value to private industry is highly desirable.

Of course, communicating this information requires some underlying organization of the data. To this end, NASA has made its existing information storehouse (fig. 12-1) available to American industry. There are some 700 000 documents in this data bank, and about 8000 additions are made each month. The documents are under full bibliographic control; that is, they are categorized by subject, indexed and multiple cross-indexed based on selected key words, microfilmed, and indexed on magnetic tape for computer search and retrieval.

The 8000 new documents per month are covered in two abstract journals (fig. 12-2). The first of these is STAR, the Scientific and Technical Aerospace Reports, and the other is IAA, the International Aerospace Abstracts. Together, these two abstract journals provide comprehensive, current coverage of the world output of aerospace related scientific and technical information.

The STAR journal (fig. 12-3), published by NASA, is issued twice each month and covers report type literature. The source of the technical documents abstracted in STAR is about one-fourth NASA and NASA contractors, one-fourth Department of Defense and its contractors, and one-fourth from other domestic sources. The balance comes from Russia, Eastern Europe, and other foreign countries. STAR is available on subscription at $33 per year.

The companion journal (fig. 12-4), International Aerospace Abstracts, is published by the American Institute of Aeronautics and Astronautics under agreement with NASA. It, also, is issued twice each month, and it covers documents reported in technical society and professional journals. STAR and IAA have identical formats and indexing systems. The source of the technical documents abstracted in IAA is 53 percent domestic and 47 percent foreign. Russia and Great Britain are the largest individual foreign sources. Like STAR, IAA is available on subscription at $33 per year.

Subscribing to these two abstract journals can be a workable method of keeping abreast of new aerospace related technology. Subscribing is, of course, the easy part. The more difficult part is in taking those necessary steps that will actually

make the journals of constructive use and value inside your company.

Something quite different in the way of information services is the NASA Technology Utilization Program. The NASA TU Program is a continuing effort to make aerospace-related innovations, new scientific knowledge, and new technical skills broadly available to industry and the public. The key word here is "available," and technology is broadly or truly available only if there are effective means for communicating or transferring it. Consequently, the NASA TU Program seeks to develop new and effective communication methods of lasting value.

A special Technology Utilization conference, such as this one, is one such method. It is hoped that an awareness of certain new, interesting, and valuable technology results from these meetings and that the reader will wish to delve further into selected technical areas.

An approach to further technical inquiry is to contact a NASA Technology Utilization Office (fig. 12-5). Major NASA field centers are located in various parts of the country, ranging from Cambridge to Houston to Pasadena. Each center has a Technology Utilization Office. The office follows the technical work being done both at the center and by its contractors, and helps to identify those innovations and new developments of most industrial interest. As a result of this work, a variety of special TU publications are issued ranging from one page Tech Briefs, which cover single innovations, to Technology Surveys, which summarize the strong forward thrust of space technology in complete fields.

An additional important area of service by each of these TU Offices is that of working directly with interested industry. The offices answer questions, supply data, arrange for technical meetings or conferences, and, in general, work to improve technical communications.

Another, and very interesting, way of keeping informed of aerospace related technology is through an NASA Regional Dissemination Center. At the Center, NASA, industry, and university cooperation makes the total NASA data bank fully and selectively available to fee paying member companies on a regular working basis.

There are presently seven Regional Dissemination Centers. They are located at the universities of Indiana, Pittsburgh, New Mexico, Southern California, and Connecticut, and at Southeastern State College, Durant, Oklahoma, and the North Carolina Science and Technology Research Center. The first of these centers was established about 5 years ago, and there are now over 350 industrial member companies, each paying annual fees ranging from $500 to over $18 000. The amount of the annual fee depends on the amount and kind of services purchased. The membership includes both small businesses and a substantial number of blue-ribbon companies. The annual membership renewal rate is well over 90 percent, a pretty fair measure of the success of the centers.

NASA input to the centers is in two parts. First, the entire NASA data bank, including the new data acquired each month is made available. Second, NASA provides funds for about one-third of the operating cost of the center. The balance of the funds comes from the universities and from the membership fees paid by private companies. NASA funding is, however, a temporary situation. The clearly stated goal is for the centers to become financially self-supporting based on membership fees alone in about 5 years.

The services provided by these centers to their member companies include the current literature service and the retrospective library search. The current literature service keeps the individual member company informed of incoming new reports and journal articles appearing in the literature in those specific areas of interest defined by the company. The areas of interest definitions are, of course, a most important part of the process. They are carefully developed by each company working with specialists from the Dissemination Center staff. Each defined area of interest is then reduced to a computer search language and is used to automatically search the magnetic index tapes furnished each month by NASA. Relevant subject matter is retrieved and furnished to the member company. This current literature service may be used to obtain pertinent incoming reports in areas such as batteries or other direct-energy conversion methods, new steam or gas-turbine developments, automatic checkout systems, or any area of specific interest to the company.

The retrospective library search is, also, a specific technical information search and selection process. In this case, however, the total existing NASA data bank is computer searched against an area of interest definition usually developed to define one particular problem area, for example, nonstick O-ring seals or plastic to metal bonding techniques.

The relation between each member company and the Regional Dissemination Center is fully confidential, and this includes such things as the company's definition of its fields of interest.

Each Regional Dissemination Center member company receives a personalized service which includes an assigned technical coordinator to maintain personal contact. The technical coordinator provides person-to-person dialogue and professional information handling judgment. The combination of personal service and computerized information storage and retrieval is making these Regional Dissemination Centers a new and useful communication link, a link that makes aerospace related technology truly available to nonaerospace industry on a regular working basis.

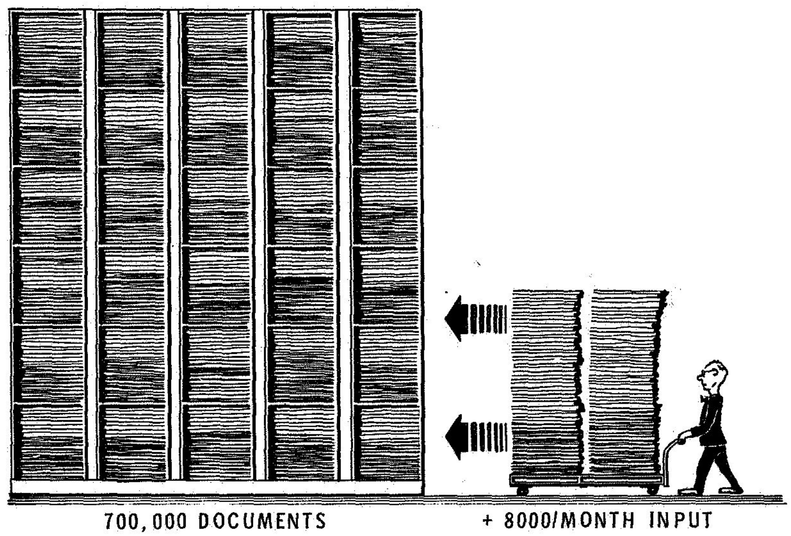


Figure 12-1. - Current NASA data bank.

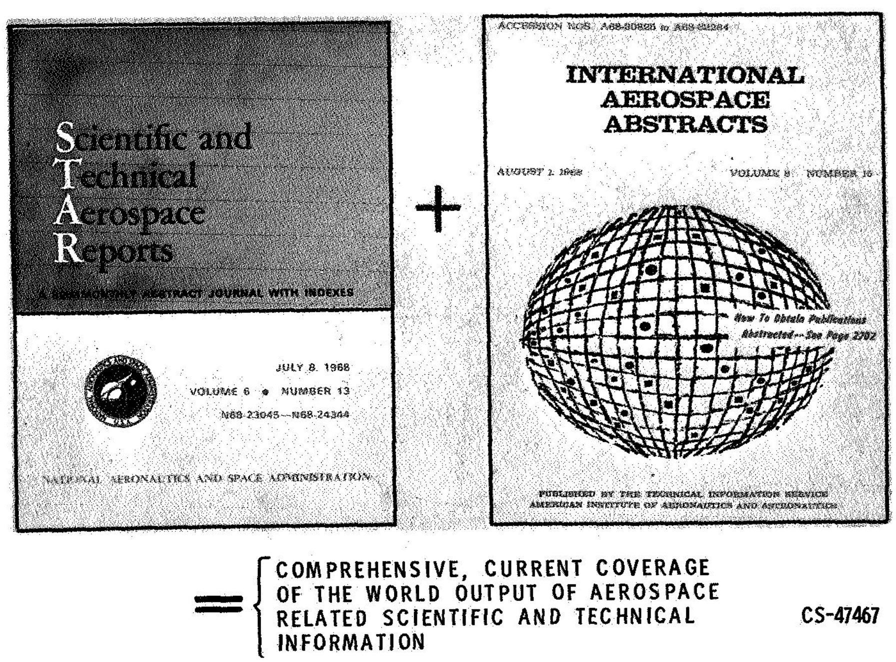


Figure 12-2. - Abstract journals.

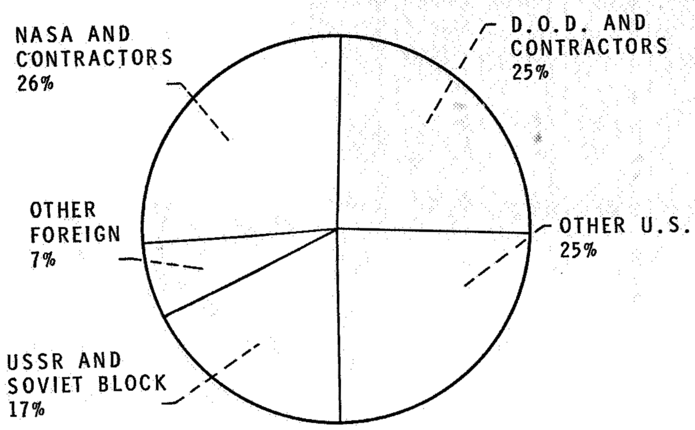


Figure 12-3. - STAR - abstracts of report literature.

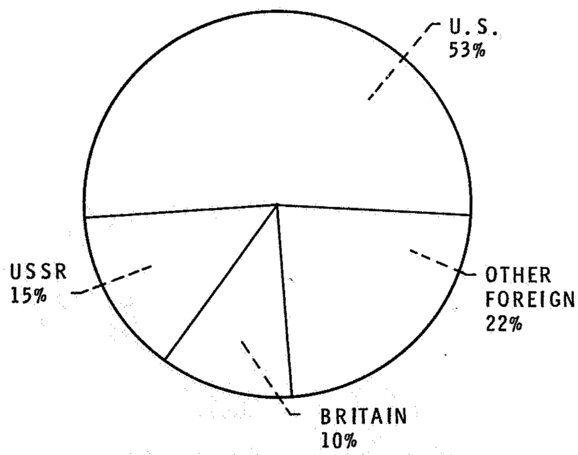


Figure 12-4. - IAA - abstracts of journal literature.

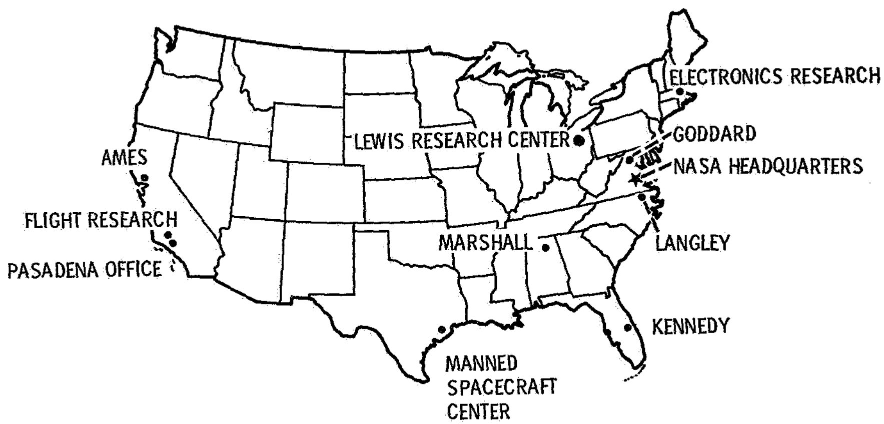
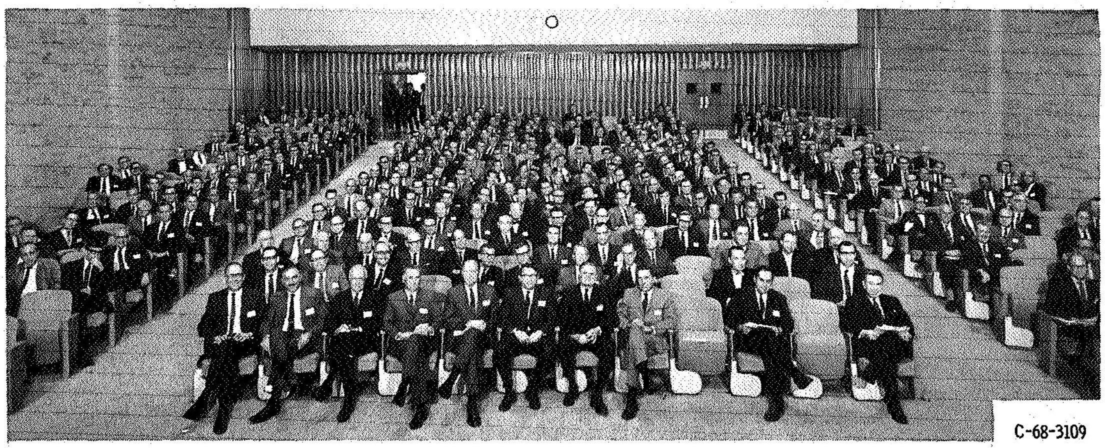
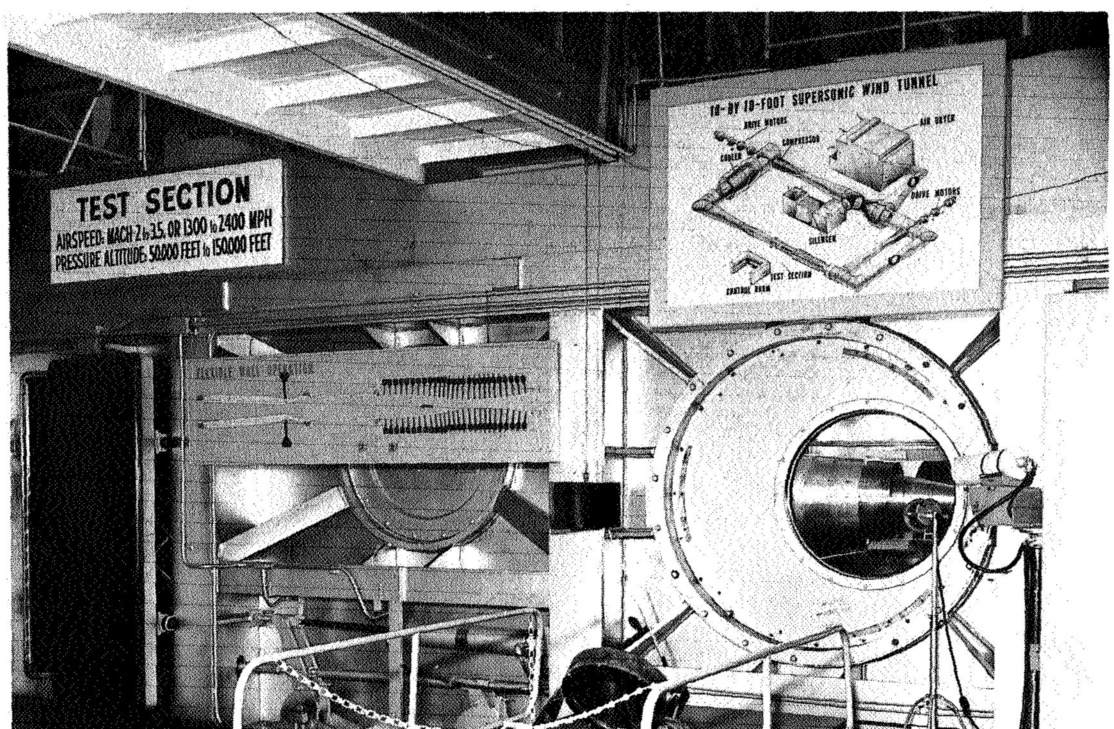


Figure 12-5. - Technology utilization offices at NASA field centers.

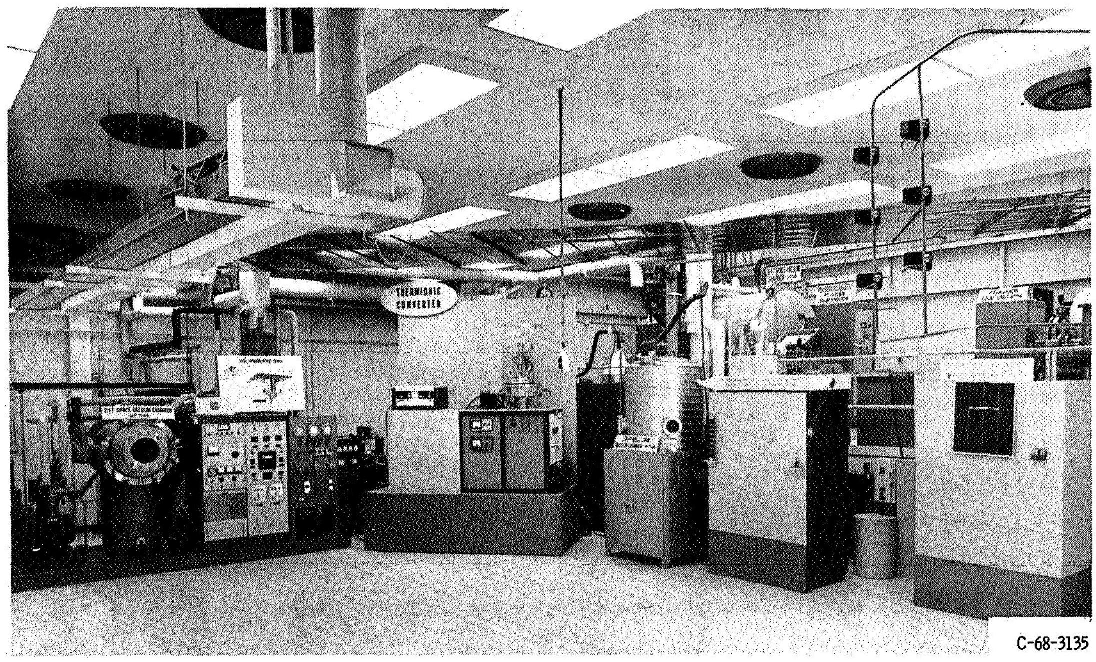
APPENDIX - CONFERENCE SCENES



Administrative and technical managers of major power companies attending the NASA Lewis Conference on Selected Technology for the Electric Power Industry.

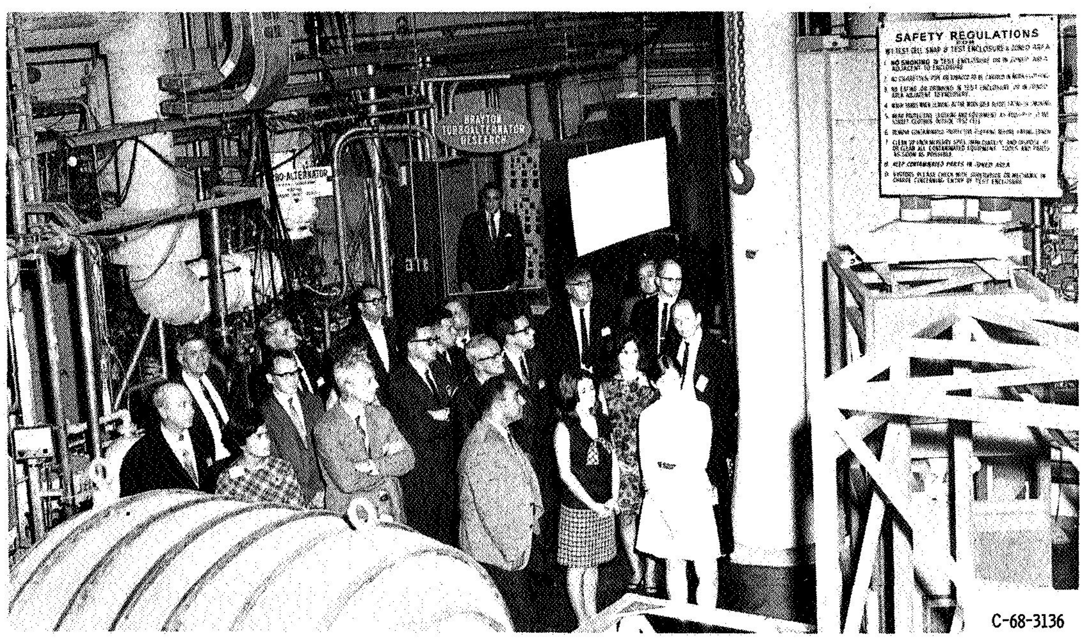


10- BY 10-FOOT SUPERSONIC WIND TUNNEL: The 10- by 10-foot Supersonic Wind Tunnel tests the performance of aircraft and rocket vehicle propulsion systems at speeds ranging from 1300 to 2400 mph and altitudes ranging from 50 000 to 150 000 feet. Supersonic speeds are obtained in the 40-foot test section by expanding airflow through a 75-foot flexible wall nozzle. During the past decade, models of many supersonic aircraft, rocket boosters, and upper-stage vehicles have been tested in this facility. At present, models of airbreathing propulsion systems for advanced supersonic aircraft are being tested.



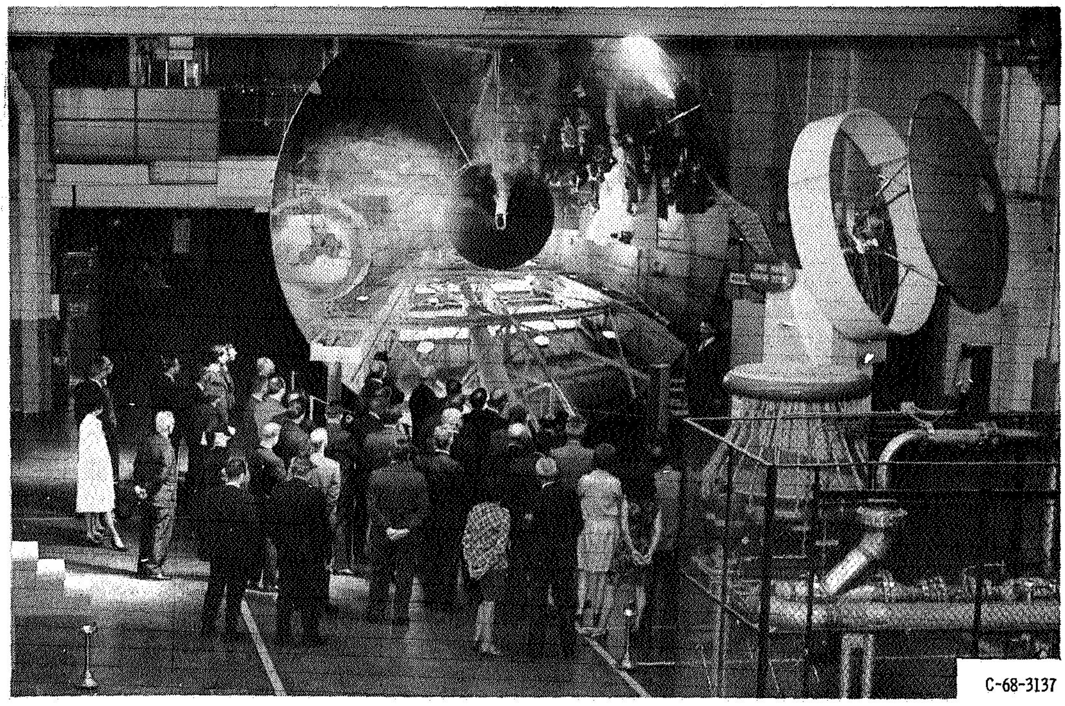
C-68-3135

DIRECT ENERGY CONVERSION: The Lewis Research Center conducts energy conversion research in many areas including thin film solar cells, advanced silicon solar cells, thermionic diodes, thermoelectric converters, high-density batteries, and batteries for use under extreme conditions of heat and cold. Several of these items were demonstrated including an experimental array of 200 cadmium sulfide thin film solar cells and batteries capable of operating at temperatures as low as -90° and as high as 840° F.



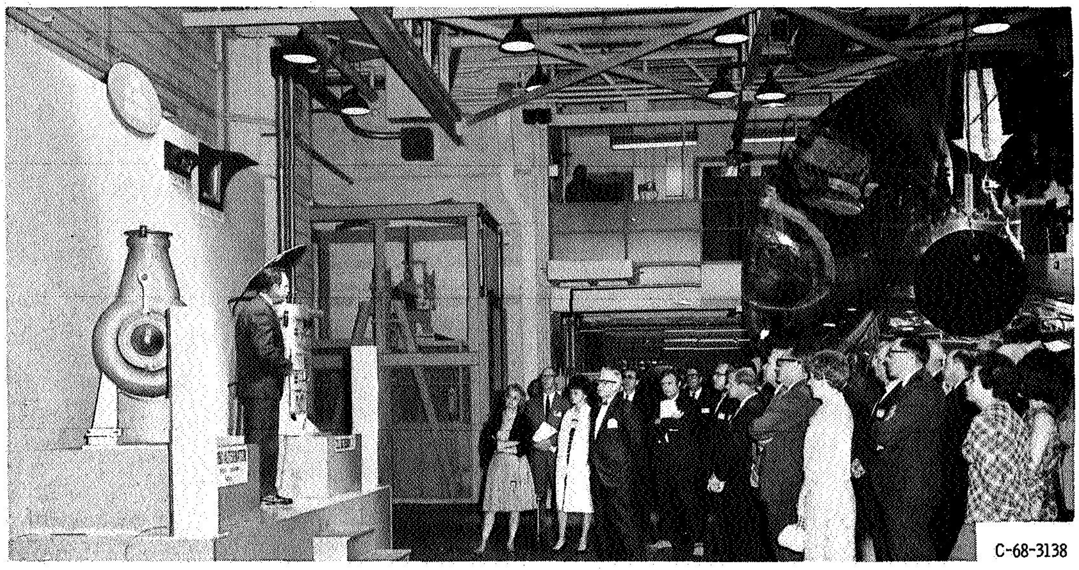
C-68-3136

BRAYTON AND RANKINE SYSTEMS: Two closed loop power conversion cycles under development to meet the future needs for large amounts of electrical power in space are the Rankine cycle and the Brayton cycle systems. Nuclear reactors can be used as a heat source for both systems. The largest Rankine cycle system under development at Lewis is the 35-kilowatt SNAP-8 (System for Nuclear Auxiliary Power). To obtain greater efficiency and lighter weight than steam plants, the SNAP-8 system uses liquid metals instead of water as a working fluid. The experimental Rankine system facility at Lewis using SNAP-8 components has logged more than 1500 hours of successful operation. An experimental 12- to 33-kilowatt Brayton system combining the turbine, alternator, and compressor on a single shaft is also in operation at Lewis. Using gas lubricated bearings, the shaft turns at 36 000 rpm.



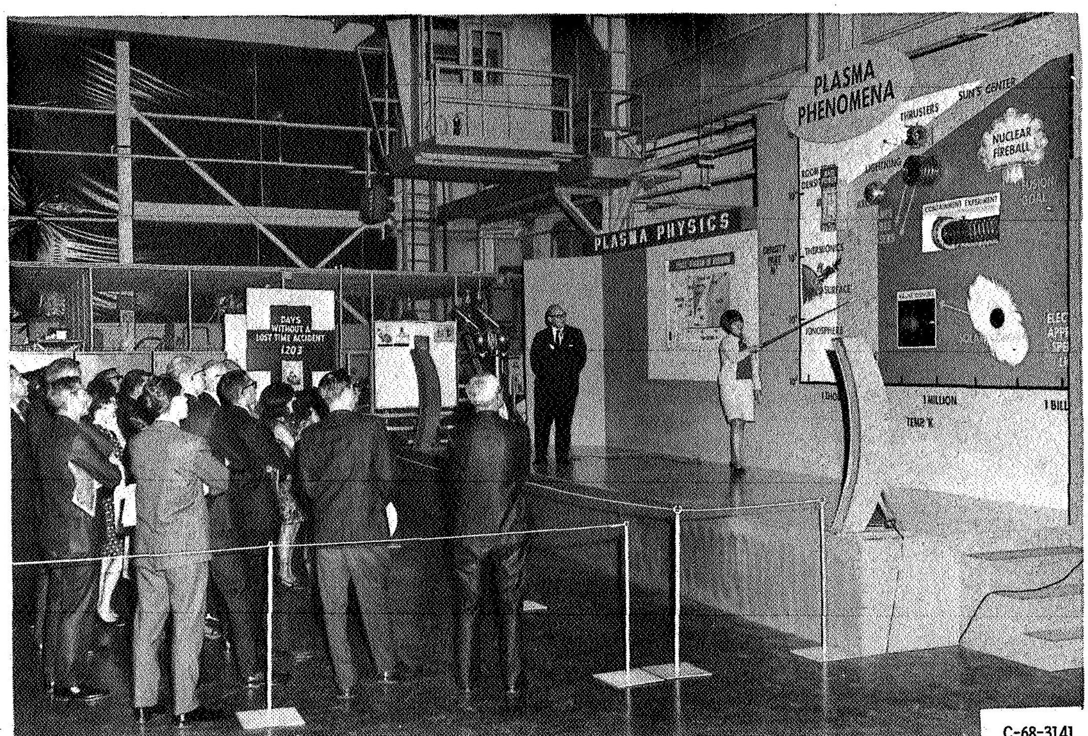
SOLAR MIRROR: One way of making use of the vast amounts of energy coming from the Sun is to use it as a heat source by concentrating its rays with a parabolic mirror. Such a mirror must have good rigidity, resistance to impact by small particles, and be light enough to launch economically. A prototype concentrating mirror meeting these requirements has been constructed at Lewis. Machined from 1-inch magnesium plate, the 12 sectors of the mirror were shaped using a unique forming process developed at Lewis. Each section was then coated with an epoxy and plated with aluminum. The mirror would concentrate the Sun's rays on a heat storage receiver containing lithium fluoride. Here the inert gas working fluid of the system is heated to produce power in a turbogenerator system, while additional heat is stored for use when the unit is in the Earth's shadow. The complete system would fold into a compact disk shape. Several could be stacked for launch.

ADVANCED COMPRESSORS: Increasing the pressure ratio and stable flow range of compressor stages is one of the goals of research at Lewis. Three research rotors were displayed which are designed for the study of improved blade shapes for high-speed operation with tip speeds of approximately 1400 feet per second. The best performing compressor rotor develops a pressure ratio of 1.82 at peak efficiency at 90 percent of design speed. This compares with an average stage pressure ratio of 1.3 for current aircraft engines and represents a significant advance in compressor technology.



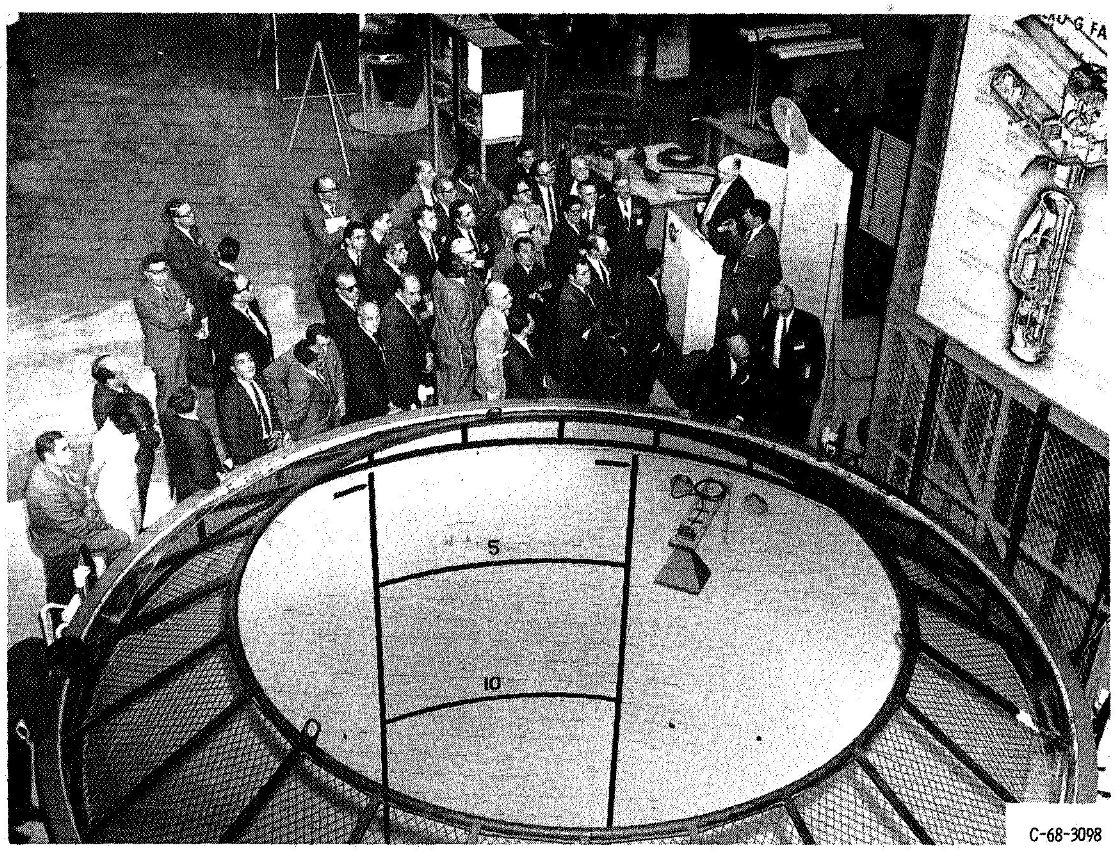
C-68-3138

GAS BEARINGS: Lewis investigation of gas lubricated bearings has resulted in increased confidence that they may be used for space power systems. A 10-kilowatt turboalternator containing gas bearings is shown along with a bearing test rig constructed at Lewis. The bearing test rig uses internal probes to sense the motion of the shaft in relation to the bearing center and displays the position on an oscilloscope screen.



C-68-3141

ELECTRIC PROPULSION LABORATORY: Plasma, the gaseous fourth state of matter made up of positively charged ions and free electrons, is being investigated at Lewis for use in both propulsion systems and space power generation systems. Since plasma is an electrical conductor, it can be acted upon by the interaction of a current with a magnetic field. This electromagnetic body force can be used to accelerate a plasma in a plasma thruster, to decelerate a plasma in a magnetohydrodynamic generator, or to contain a plasma in a "magnetic bottle." Both basic research into the nature of plasmas and applied research into methods of using their properties are conducted at Lewis. One interesting experiment recently was the use of a plasma rocket engine to simulate and study the interaction of the solar wind with the Earth's magnetosphere.



ZERO GRAVITY FACILITY: The Lewis Zero Gravity Facility is the largest drop tower in the United States for producing the weightless conditions of outer space. Actual free-fai, distance is 450 feet, producing 5 seconds of weightlessness. This time is doubled when experiment packages are projected upward from the bottom of the shaft and then fall back to be caught in the decelerator cart. The experiment packages are caught in a decelerator 19 feet deep and 12 feet in diameter filled with millions of polystyrene pellets. Experiments can vary in weight from 500 to 6000 pounds. Shaft air pressure is reduced during testing to eliminate the need for a drag shield. Typical experiments are for the study of the behavior of fluids in a tank or during a pumping process in the weightless environment. Data are recorded primarily on motion picture film.